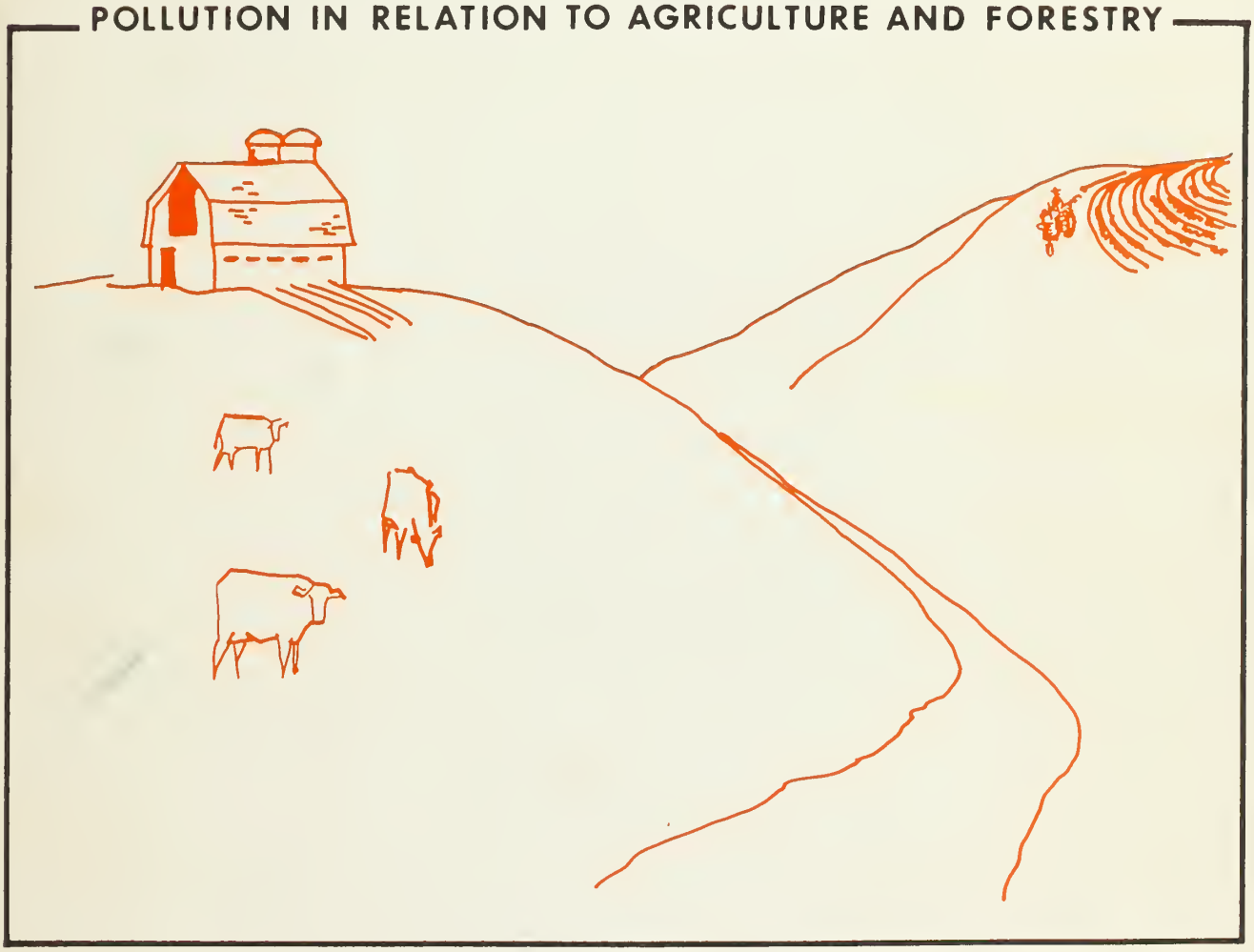
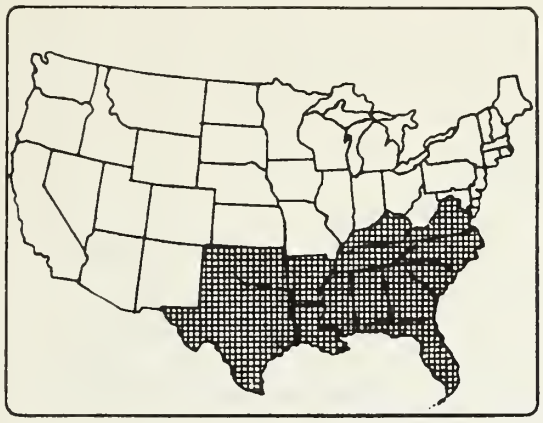
ENVIRONMENTAL QUALITY-

POLLUTION IN RELATION TO AGRICULTURE AND FORESTRY



A Program of Research for the Southern Region

Revised 1974



ENVIRONMENTAL QUALITY

Pollution in Relation to Agriculture and Forestry

(Original Report Issued April 1970)

Prepared by a

Joint Task Force of the
Southern Agricultural Experiment Station Directors
and the
U. S. Department of Agriculture

Revised and Updated
October 1974

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FOREWORD
(From Task Force Report - April 1970)

In October 1966, a report entitled "A National Program of Research for Agriculture" was issued as the result of a study sponsored jointly by the Association of State Universities and Land Grant Colleges and the United States Department of Agriculture. The report evaluated this country's then current strengths and weaknesses in agricultural research and identified problems facing agriculture and forestry in the years ahead. It was further noted in this report that the solutions of these problems offered great potential benefits to the public. On the basis of these problems and the benefits to be obtained via their solution, the report provided an inventory of our research efforts in 1965 and made recommendations as to the allocations of resources for agricultural research for 1972 and 1977.

Three major factors were used by the national task force in developing the 1966 report, and in making their recommendations. These are:

1. Relative importance of the problems.
2. Amount of scientific effort needed to answer the research questions.
3. Current scientific effort devoted to the problems and progress being made toward finding answers to the researchable questions.

Thirty-two national task forces were appointed to study the problem areas and research needs considered to be related to their respective topics. One of these task forces was specifically concerned with ENVIRONMENTAL QUALITY -- Pollution in Relation to Agriculture and Forestry. This task force issued its report which summarized our current efforts toward the control of pollution via agricultural research. It grouped agriculturally related pollution problems under twelve general headings. Each pollutant and subject area was described under three headings: (1) The Problem, (2) State of the Art for Dealing with the Problem, and (3) Research Needs. The proposed research activities were projected in terms of SMY's (Scientist-man-years) as envisioned for the national program or overall needs of the nation. It was interpreted to be a 50-50 program divided between (1) the State Agricultural Experiment Stations and forestry schools and (2) the United States Department of Agriculture. No breakdown was included in the report concerning the contributions to be made by each region towards the national objective.

Upon the recommendations of the Southern Regional Research Committee, the Directors of the Agricultural Experiment Stations of the Southern Region, in their meeting of September 3-5, 1969, took action to establish a southern regional task force relative to research on Environmental Quality. This task force was asked to consider the importance of Environmental Quality in the region in line with researchable problems, to determine those research topics which appear to be of the

greatest importance for the region, and to make recommendations concerning factors related to this research. Potential factors which the regional task force was to consider included scientists-man-years as input, potential subjects for regional research efforts, and changes in land use which affect agriculture and agri-business especially as these changes are related to pollution.

INTRODUCTION
(From Task Force Report - April 1970)

The production and processing of agricultural and forest products affect the quality of our environment to a very significant degree and in many complex ways. Conversely, many changes in our environment profoundly affect agriculture and forestry. Research that may enable us to understand, predict and control these complicated interrelationships deserves our most intensive efforts over the next ten years. The critical nature of many problems in this area is rapidly becoming apparent to a wide segment of our population. Hence, there should exist not only strong support, but an urgent demand, for intensive research and development aimed at the alleviation of these problems.

Agriculture and forestry in the Southern Region of the United States, with which this Task Force is primarily concerned, is in a fortunate position in some respects. The diversity and relative dispersal of these activities in our region have spared us from some of the more acute and dramatic environmental problems already encountered in other regions. However, our advantage may prove to be illusory. Because of our diversity we must contend with a wider array of problems which individually may not assume the urgency that they deserve collectively.

Our discussions indicated that every category of pollutant and subject area identified in the report of the national task force was of concern to the southern region. We have attempted to identify those activities of agriculture and forestry that may be expected to be of increasing importance and magnitude in our region in the future and to focus on the environmental problems associated with them. Although these activities and associated problems are not unique to our region, several factors serve to add different dimensions. These include our longer growing seasons, mild winters, heavy rainfall, a wide diversity of soil and topography, and relatively small farm units. Those activities that we identified as deserving our intensive consideration are the production and processing of animal products, fruits and vegetables, fish and seafoods, and forest products. In particular we are concerned with disposal and utilization of waste materials from the production and processing of these commodities (Research Problem Area 901 - Alleviate soil, water, and air pollution). All of these waste materials ultimately must be recycled in nature and we should seek to integrate them into this fundamental biological process.

Perhaps the most significant concepts to emerge from the deliberations of this task force were: (1) research on each problem should be of a broad inter-disciplinary nature, and (2) each problem is essentially inseparable from many other problems. For example, if the problem is disposal of waste from poultry production and processing we should consider (1) utilization of this waste as nutrients for plants, animals or fish, (2) the possible spread of infectious agents or toxins, (3) water pollution, (4) air pollution, and numerous other topics in our program of research. Narrow approaches may enhance knowledge of problem segments without providing for total solution or control.

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SECTION 1

ANIMAL PRODUCTION AND PROCESSING WASTES AND THEIR UTILIZATION

Water pollution by wastes arising from production and processing of animals has been associated with oxygen depletion, excessive nutrient loads and unsightly appearances in streams. Infectious agents, insects, and dust can cause animal and human health problems. Obnoxious odors, and dusts cause air pollution. There is a tremendous research challenge to find ways to use these production and processing wastes wisely and effectively for land amendments, feeds and industrial products and to avert these becoming sources of environmental pollution. The research in this section would be suitable for regional research efforts.

Research Topics and Priorities

PRIORITY: 1/5

TITLE: Management of Organic Wastes from Confinement Reared Livestock

Situation Statement:

There is a rapid shift to total confined rearing of all meat and milk producing animals. The large quantity of wastes generated by confinement reared animals creates serious environmental problems. Legal requirements preclude discharge of these wastes into waterways. New technology is urgently needed to find ways to utilize these animal wastes which represent an important resource. They can be recycled as animal feed and as plant nutrients. Economic comparisons of the relative value of these wastes between various uses and disposal methods are needed.

PRIORITY: 2/5

TITLE: More Effective Utilization of Solid Wates from Animal Processing

Situation Statement:

Much of the solid wastes from animal processing has potential for recycling as feed or as raw materials for other usable products. Investigations of waste items available in large quantities (such as feathers, blood, paunch manure, etc.) should be done separately in order to evaluate their nutritional and/or industrial potential.

PRIORITY: 3/5

TITLE: Land Application of Animal Wastes

Situation Statement:

Further research is needed on the effects of continued heavy application of animal wastes on the quality of surface and subsurface drainage water and upon the soils and crops. This includes changes in the soils, accumulation of certain elements, losses of nutrients from runoff and percolation, and utilization by crops.

PRIORITY: 4/5

TITLE: Treatment of Waste Effluents from Animal Processing Operations

Situation Statement:

There is a need to minimize the water usage in animal processing in order to reduce the waste effluent volume. There is also a need to investigate the special treatment of high concentration-low volume effluents (e.g. whey, scalding, tank waste, floor washings, etc.) to recover utilizable products and to facilitate treatment prior to waste dilution when treatment becomes very difficult and expensive.

PRIORITY: 5/5

TITLE: Dust, Odors, and Vermine Generated by Confinement Reared Livestock Create Major Potential Pollution Problems

Situation Statement:

Economic and management parameters favor a rapid shift to confined rearing of animals. Current facilities and equipment are inadequate for monitoring dust, odor, and vermine problems. Furthermore, there is lack of expertise to comprehend and control these hazards to the environment. A variety of hazards are involved. Differences in climatic patterns and localized environmental conditions need to be considered. Different species of livestock provide diffuse experimental conditions as well.

SECTION 2

PLANT PRODUCTION AND PROCESSING WASTES

Production and processing of field and vegetable crops results in a diversity of waste products, many of which are environmental pollutants and have adverse effect upon the inhabitants of land and water. Research is needed to develop further economic uses of production and processing wastes and to determine treatment techniques that will provide effective recycling of the wastes. Topics in this section would be suitable for regional research efforts.

Research Topics and Priorities

PRIORITY: 1/3

TITLE: The Reduction of Processing Waste Effluents

Situation Statement:

The waste effluent streams from processing plants could be substantially reduced by modification of existing processing techniques which would reduce the volume of water used and produce more concentrated effluents which may be more readily treated. Lower volumes of more concentrated wastes from specific unit process are amenable to segregation and separate treatment. Such practices reduce the total waste load and offer possibility of further economic recovery of waste by-products. Air pollutants from processing plants will probably be reduced by implementation of existing technology to meet air quality standards.

PRIORITY: 2/3

TITLE: Industrial Utilization of Production and Processing Wastes

Situation Statement:

Continuing research is needed on the further utilization of primary wastes such as bagasse, peanut and pecan hulls, plant trash, fruit pits, etc. However, there is increasing concern for utilization of secondary wastes including biological waste treatment sludges from canning, freezing and brewery operations. These have potential for highly nutritive foods or feeds and for special industrial use.

PRIORITY: 3/3

TITLE: Control of Pesticide Contamination of Agricultural Foods, Feeds, and By-Products

Situation Statement:

The utilization of plant production and processing wastes implies strict control of pesticide levels in secondary feed products and also as unintentional additives in air, soil and water during the handling and processing operations. Monitoring research is needed to insure safe patterns of pesticide redistribution.

SECTION 3

THE PULP AND PAPER INDUSTRY

Over 60 percent of the pulp and paper production the U.S.A. is located in the Southern region. The sulphate or kraft process is paramount due primarily to the nature of the wood supply. The industry discharges every day several thousand tons of water and air pollutants into our environment. The major water pollutants are dissolved degradation products from the wood constituents and suspended organic and inorganic solids. The effects are depletion of the water of its oxygen content and interference with reproduction of aquatic life. The prime air pollutants are sulfur dioxide and particulate outfall from the chemical recovery units and the power boilers. A nuisance from the kraft pulping industry is the release of the odorous non-condensable sulfur compounds.

The pulp and paper industry is spending large sums to reduce effluent discharges both by inplant pollution abatements and treatments of wastes. However, present discharges of pollutants still generally exceed acceptable levels, and much research and development work is needed to find economically tolerable solutions.

Research Topics and Priorities

PRIORITY: 1/2

TITLE: Disposal of Mill Effluents and Sludges on Agricultural and Forest Lands

Situation Statement:

Meeting standards for air-land-water pollution abatement has escalated costs of southern paper products to all consumers. Application of wastes to agricultural and forest lands could drastically reduce costs when compared to secondary and tertiary water treatment and may create benefits in terms of increased production of food and fiber while preventing impairment of water resources. Included is composting and application of sludges as an alternative to landfills on agricultural and forest lands and to incineration. This topic should be suitable for regional research.

PRIORITY: 2/2

TITLE: Improvement of Primary, Secondary and Tertiary Waste Treatment Processes and Utilization of the Resulting By-Products Including Fuels, Fibers, Foods, and Medical Agents

Situation Statement:

Improvement of water-treatment technologies are sorely needed to reduce costs whether the effluents are returned to streams or in concert with application on

agricultural and forest lands. Defining environmentally acceptable practices to dispose of wastes and evaluating the possible benefits of increasing crop and forest production, recycling groundwater supplies, and improving streamflow quality will require prompt and substantial research attention with a multidisciplinary approach. This topic should be suitable for regional research.

While the South is already producing more than one-half the nation's wood fiber, the demand is expected to double in less than 25 years. Demands for many southern products already exceed supply. The industry is rapidly conforming to air-land-water pollution control standards and most of the necessary technologies are available -- but they are expensive and major innovations will be required to reduce costs. Much of the in-plant research for chemical recovery which requires a closed water system will be done by the industry. The agricultural-forestry interface primarily involves land application of mill effluents and sludges and the possible conversion of wastes to food, medicinal and other resources.

SECTION 4

FORESTRY PRODUCTION AND PROCESSING WASTES

A concerted effort should be made to strengthen research programs concerned with environmental quality in (1) the management of southern forest land, (2) the harvesting of the resources therein, and (3) the processing of the various products. A quantitative evaluation of the emissions from prescribed burning and their contribution to air pollution are urgent. Improved means of handling harvest wastes are necessary in order to minimize possible contamination of the soil, water, and atmosphere. Opportunities still exist for more efficient processing of wood products and improved utilization of waste material in the forests and mills of the South.

Research Topics and Priorities

PRIORITY: 1/2

TITLE: Develop Alternatives for Prescribed Burning of Agricultural Range and Forest Lands

Situation Statement:

Prescribed burning of agricultural wastes and southern forest-range lands, while an accepted and recommended practice, is a factor to be considered in air pollution. Alternatives requiring research to reduce this possible pollution source include chemical suppression of undesirable plant and range species, chemical or biological control of insect and disease pests (e.g. brownspot in longleaf pine), fuller utilization of agricultural and forest crops, (full-tree logging), etc. Suggested for regional research.

PRIORITY: 2/2

TITLE: Utilization or Elimination of Wood Harvesting and Processing Waste Products

Situation Statement:

The production and processing of forest products results in large volumes of low-value by-products (shavings, bark, sawdust, etc.) Research is needed to develop economic processes to convert these wastes into useful products (fuels, mulches, insulation materials, animal feeds, etc.), and to develop techniques to reduce the volumes of such wastes. Alternate procedures include leaving them in the forest without creating a problem, utilizing the heat if they are burned, or eliminating wastes such as by using chipping saws so that the equivalent of sawdust can be used for paper manufacture. This represents a possible area for regional research.

Concern for environmental quality is limited here to processing and prescribed burning. Topics concerned with the management of the forest and the harvesting of the resource is covered by the 2.05 T.F. on Forest Watersheds, Soils and Pollution. Smoke pollution from prescribed burning is covered by the 2.03 T.F. on Forest Protection. Problems requiring research are in order of priority:

1. Find alternatives to prescribed burning.
2. Utilization or elimination of wood wastes (bark, sawdust, slash, etc.)
3. Abatement of pollution from burning.

SECTION 5

PLANT NUTRIENTS AND MINERALS

Plant nutrients and minerals which are essential for production of food and fiber may contribute to nutrient runoff and deep percolation into ground water.

Research Topics and Priorities

PRIORITY: 1/4

TITLE: Development of Management Practices that Reduce Nutrient Entry into Ground and Surface Water

Situation Statement:

Nutrient pollution of ground and surface waters by fertilizer nutrients is an unintentional effect.

Current critical shortages of fertilizer, and energy emphasizes the need to use fertilizers efficiently and reduce leaching and runoff losses. Various management techniques and new technological formulations would reduce such losses and nutrient pollution of waters.

PRIORITY: 2/3

TITLE: Micro-nutrients and Growth Hormones and Regulators in the Soil and Aquatic Environments

Situation Statement:

Generally, information is lacking as to problem involved. A limited effort should be made to explore the problem if manpower is available. Micro-nutrients can become toxic to plants if allowed to accumulate. Specific effects can occur at low levels of concentrations.

PRIORITY: 3/4

TITLE: Effect of Soil-Water Management on Plant Nutrient Concentrations in Aquatic Environments

Situation Statement:

Drainage of lands for development (agricultural, industrial, urban, recreational, etc.) including channelization lowers the water table and reduces the residence time in streams. Resulting changes in soil physical structure, water movement, and soil-moisture change the rate of oxidation of organic matter and the retention of plant

nutrients. As a result, plant nutrients are released from natural sources yet these pollutants are often accredited erroneously to agricultural practices. The increased flow rates in channelized streams reduces the retention time, thus reducing the assimilative capacity of the stream.

PRIORITY: 4/4

TITLE: The Physical and Chemical Mechanism of Nutrients Movement in Solution, and Sediments in Drainage Basins.

Situation Statement:

Problem should be studied at one or two locations until general features are determined. General problems and procedures need development first.

SECTION 6

SEDIMENT

Sedimentation is the process by which natural forces act to move solid materials from a source to a place of deposition. In terms of volume, sediment is the greatest pollutant in the Southern Region with an annual deposition of about 1.3 billion tons. In addition, sediment is the carrier of other pollutants such as pesticides, plant nutrients, and other chemicals. Understanding the sedimentation process per se and the interaction of sediment with other pollutants is vital to maintaining and improving environmental quality. These topics should be suitable for regional research.

Research Topics and Priorities

PRIORITY: 1/2

TITLE: Improved Management and Methods of Application of Plant Nutrients, Pesticides, and Other Chemicals as They Impact Upon Accumulation on Channel and Reservoir Sediments. (Closely related to research mentioned under Section 5)

Situation Statement:

This research need is being emphasized by the current world effort to produce increasing amounts of food, feed and fiber. At the same time, this research must balance against the need to economize on energy-derived materials and protect the environment.

PRIORITY: 2/2

TITLE: Sediment as a Mechanism for Transport and Accumulation of Pesticides, Plant Nutrients, Disease Organisms, and Radioactive Substances

Situation Statement:

Sediment, per se, is by far the most important water pollutant in the Southern Region on a volume basis and is very active chemically. The smaller sediment fractions adsorb pollutants on their surfaces. Damage is incurred in loss at point of removal, damage at point of deposition, and deleterious impact in the aquatic environment.

These pollutants are transported as part of the sediments. The chemical sorption of these pollutants reduces the concentration in the solution phase but may lead to water transport of very insoluble materials. Subsequent deposits and changes in water chemistry may lead to the release of the pollutants into aquatic food chains. Suitable for regional research.

SECTION 7

ENVIRONMENTAL HEALTH HAZARDS

Infectious, irritating, and esthetically unacceptable agents from agriculture and forestry which contaminate the environment include diseases of plants, animals, and man; allergens in air and water; exudates of plants and organic waste products; pesticides and their residues, pathogens from sewage and sludge recycling and toxic by-products of the microflora infesting plants and animals. These problems have become critical to public health because of (1) great concentrations of people and animals and (2) economic and technological factors that favor rearing meat and milk producing animals in confinement. Development of methods which protect the environment and permit efficient utilization of resources for the production of food and fiber requires a coordinated multidisciplined research effort to reduce environmental hazards.

Research Topics and Priorities

PRIORITY: 1/3

TITLE: Pathogens in the Environments Which are Potential Hazards to Human Health and Welfare

(a) From sewage, sludge, animal waste.
(b) From improperly managed domestic animal carcasses.
(c) From abandoned pets which become reservoirs of rabies, tick fever, viral diseases and other human diseases.

Situation Statement:

The use of the agricultural soil-plant system to recycle and renovate sewage, sludge and animal wastes by the removal of plant nutrients leaves the fate and hazards from human pathogens unresolved. The soil has been shown to adequately filter bacterial pathogens in most cases, but the fate of viral pathogens in unknown. Soil type, and cultural practices influence the rate of destruction of microorganisms and viruses in the environment. Because of increasing cost of transportation, there is much less economic incentive to use dead farm animals for salvage. Thus, carcasses remain in place to decay and become a menace to public health. Finally, the greater participation of the population in outdoor recreational activities results in pets, especially dogs, being lost or abandoned in rural areas. These animals frequently band together where they form hunting packs which destroy wildlife; domestic animals, and represent potentially dangerous reservoirs of disease.

PRIORITY: 2/3

TITLE: Safety to Agricultural Workers in Areas Previously Sprayed with Agricultural Pesticides

Situation Statement:

It is evident that regulatory and public health agencies are becoming increasingly concerned about the health hazards to agricultural workers exposed to residual pesticides or their residues. In most instances it has been assumed that this hazard was minimal, but there is accumulating evidence that the hazards have been underestimated and that there are regional differences that may be related to physical environmental parameters. Data are needed to access the hazards from pesticides to workers from various pesticides, application rates, waiting periods, environmental parameters, and residues of the pesticide or their decomposition.

PRIORITY: 3/3

TITLE: The Control of Pollen Allergens from Noxious Plants

Situation Statement:

Allergic disease syndromes affect an increasing portion of the human population. This problem is intensified by concentrations of people and animals. Thus, people live in close proximity to noxious weeds. In addition, improved food production contributes significantly to the production of pollen yielding plants. Control measures are necessary, but these controls must be properly developed so that the total welfare of the community is enhanced.

SECTION 8

PESTICIDES

Development of reliable pest control methods with minimal contamination of the environment by toxic pesticide residues constitutes a significant obligation of agriculture. In order to meet this obligation research in all aspects of pesticide action and use must be pursued. Those research aspects which will provide the quickest short term means for improving environmental quality must not be pursued to the exclusion of other avenues of research because environmental quality is a long term problem. All research which will protect and improve the environment is important. Therefore, it is difficult to assign priorities.

It is apparent, however, that persistent pesticides must be replaced when possible by safer, shortlived, target-specific chemicals or biological control agents. It is appropriate to point out that biological control agents with but a few exceptions have been particularly efficacious. Pesticide research must be continuous in order to develop chemical control methods that are compatible with the preservation and improvement of environmental quality. Pesticide research endeavors have been considerable in the past, and must not be diminished in the future. It may be desirable to change the direction and thrust of the research effort to meet the problems of environmental quality. With this in mind, the research subjects suggested in this report represent some change in research direction. Regional research projects could be developed.

Research Topics and Priorities

PRIORITY: 1/7

TITLE: Research on Physiological Effects of Pesticides on Domestic Animals, Wildlife, Microflora and Microfauna in the Environment

Situation Statement:

The current research effort in this area is supported by regulatory requirements related to environmental hazards when a pesticide is registered. Research must be continued to generate new advances to avoid unexpected physiological effects of pesticides on domestic animals, wildlife, microflora and microfauna in the environment.

PRIORITY: 2/7

TITLE: Treatment to Accelerate the Physiological Elimination of Pesticides from Domestic Animals

Situation Statement:

Research is needed relating to the use of pesticides for protection of domestic animals intended for meat production. Results should be reduced costs of production for wholesome meats, reduced feed utilization and an improved food supply for the consumer.

PRIORITY: 3/7

TITLE: Monitoring and Determining the Fate of Pesticides and Breakdown Products

Situation Statement:

Pesticides and their breakdown products can be distributed through many avenues of our agricultural production system. Knowledge of the distribution of pesticides is essential to maintaining a quality production of food and feed. Thus, a continuing research and monitoring effort is necessary for the fate of pesticides and their breakdown products.

PRIORITY: 4/7

TITLE: Research on Plants, Animals, and Consumers from Use of Systemic Pesticides

Situation Statement:

The regulatory process for systemic pesticides supports the need for continued research on plants, animals, and consumers following the use/consumption of systemic pesticides. Continuing research is needed to advance the physiological knowledge on the action and effects of systemic pesticides.

PRIORITY: 5/7

TITLE: Improved Techniques for Applying Pesticides

Situation Statement:

Continuing research is needed to improve the efficiency and safety of pesticide applications. Some of the contributions of improved techniques of pesticide application will be: (1) advances in application of the pest management programs; (2) minimize the current pesticide shortage; (3) aid in the long range need to conserve the petro-chemical feedstocks used to produce pesticides; and (4) permit the increase in our food production while preserving the quality of our environment.

PRIORITY: 6/7

TITLE: Establishment of Acceptable Pest Levels (Control vs. Loss)

Situation Statement:

Recent advances in pest control have demonstrated the need to establish acceptable pest levels. This research objective requires establishment of pest levels that can exist without causing economic loss. An increased research effort is needed.

PRIORITY: 7/7

TITLE: Methods for Improved Biodegradation of Pesticides

Situation Statement:

Research has been undertaken to determine the methods of bio-degradation of pesticides in the environment. Additional information is needed to continue the use of pesticides in an agriculture required to increase production and maintain environmental quality.

SECTION 9

PEST MANAGEMENT

It is essential that pest management practices be developed if we are to reduce pesticides in the environment while at the same time increasing production of food, feed and fiber to support a growing population in the United States. The potentials for advances in pest management are great for the Southern Region of the United States. This is especially true for crops of major economic importance such as cotton, tobacco, citrus, vegetables, sugar cane, etc., which in most instances are found in other regions. The moderate climate and long growing season add emphasis for research in this area. Many of these topics would be suitable for regional research.

Research Topics and Priorities

PRIORITY: 1/5

TITLE: Develop Pest Management Programs for Non-Boll Weevil Pests on Cotton

Situation Statement:

A pest management program for other cotton pests in conjunction with the projected boll weevil eradication program will minimize the need for large scale pesticide applications on cotton. This pest management research effort will evaluate benefit/risk, especially as related to reentry problems.

PRIORITY: 2/5

TITLE: Develop Pest Management Programs for Tobacco, Citrus, Vegetables, Sugar Cane, etc.

Situation Statement:

A pest management program on tobacco, citrus, vegetables, sugar cane, etc., will minimize the need for broad-spectrum persistent pesticides on these crops. This pest management research effort will evaluate benefit/risk, especially as related to reentry problems.

PRIORITY: 3/5

TITLE: Develop and Test Specific Bio-Control Agents Such as Viruses and Bacteria

Situation Statement:

Research will be directed at developing and testing specific bio-control agents for the purpose of minimizing introduction of chemical pesticides in the environment which affect non-target organisms.

PRIORITY: 4/5

TITLE: Evaluate Hormone-Type Regulators for Pest Control

Situation Statement:

There will be need to investigate the use of hormone-type regulators in pest management programs. The research will also determine effects; if any, on target crops, etc., and the non-target species.

PRIORITY: 5/5

TITLE: Develop and Test Specific Biodegradable Pesticides

Situation Statement:

This research program of developing and testing specific biodegradable pesticides will be aimed at reducing the amount of persistent pesticide in the environment and avoiding effects on non-target organisms.

SECTION 10

AIR POLLUTION

Agricultural burning of pastures, crop residues, debris from clearing land, and cold protection fires produce air pollution. Crops are damaged by industrial and agricultural air pollutants in the Southern Region, such as pollutants from the petrochemical, power, and cotton ginning industries. Climatic factors effect the movement, duration, concentration and chemistry of air pollutants. Information gathered outside the Southern Region on air pollutant may not adequately describe the pollutant's behavior within the Southern Region.

Research Topics and Priorities

PRIORITY: 1/4

TITLE: Identify and Predice Meterological and Environmental Conditions Most Suitable for Burning for Non-Forest Crops (e.g. Sugar Cane and Grasses)

Situation Statement:

As the cost of grass seed production in Northwest United States is rapidly increasing because of legal constraints on open field burning, grass seed production is likely to shift to other areas including the Southern Region thereby adding to existing air pollution problems if residue burning is practiced.

Other currently accepted management practices which generate potential air pollution include burning coastal bermuda grass fields for disease control, burning sugar cane to aid harvesting, and burning residues from land clearing to open new lands for food production. Prunings, straw, and other production trash are commonly burned. Burning is also practiced to control noxious plants. Legal restraints are likely to result. Techniques are needed which increase dispersion, lower emissions, and reduce air pollution. Should be suitable for regional research.

PRIORITY: 2/4

TITLE: Alleviate Air Pollution From Particulate Matter and Odors Generated in Handling and Processing Agricultural Products, Manufacture of Agricultural Inputs, and Animal Production

Situation Statement:

Air pollution from cotton gins, alfalfa and grass dehydrating plants, manufacturing of phosphates, feed and grain mills, particulates and odors from feed lots are examples of particulate matter and odors needing research attention. Many of these

problems are highly localized, but are critical for those areas. Impact on agricultural crops of industrial pollution should be determined.

PRIORITY: 3/4

TITLE: Develop Alternatives for Prescribed Burning (Agriculture)

Situation Statement:

Air pollution will severely restrict use of prescribed burning now considered an integral part of accepted management practices for disposal of agricultural residues, preparation of land and land clearing, pasture and range lands management, and weed-disease-pest control. Alternate management practices must be developed to maintain yields and production efficiency but reduce pollution. Suitable for regional research.

PRIORITY: 4/4

TITLE: Development of Methods and Techniques Which Reduce Air Pollution From Devices Used to Protect Cold Sensitive Crops from Damage

Situation Statement:

Citrus, sugar cane, deciduous fruits, tropicals fruits and winter vegetables are all subject to low temperature injury. Cold protection methods, especially the use of fires produce transient air pollution. There is a need to develop non-polluting methods as well as development of heating devices with reduced emissions.

SECTION 11

HEAT PRODUCTION AND RADIATION CONTAMINATION

Heat pollution from nuclear and fossil fuel power plants changes the composition, and production of the aquatic environment. The thermal discharges are mostly of low temperature ($\leq 100^{\circ}$ F) waste heat. Efforts should be made to utilize the waste heat, but the primary effort should be to minimize the adverse effects. To utilize waste heat effectively it must provide a major sink on a continuous basis.

Worldwide fallout contamination from nuclear testing is at a relatively low level and is declining. However, biomagnification occurs in many animals through predation or feeding on lichens, as in the reindeer in Scandanavia. Fertilization and liming have been shown to alleviate the problem of radionuclide uptake in agricultural plants and animals.

Research Topics and Priorities

PRIORITY: 1/4

TITLE: Use of Heated Waste Water in Fish and Aquatic Culture

Situation Statement:

Catfish and other aquatic food species are often grown more efficiently in waters of temperatures at 70° or above. Feeding and reproduction efficiency are increased when such temperatures are maintained and reproduction is improved. Waste waters in these temperature ranges represent a resource for improved production practices, especially in fish production.

PRIORITY: 2/4

TITLE: Use of Waste Heated Waters to Obtain Increased Frost-Free Growing Periods for Crops

Situation Statement:

Many crops grown in the South are limited in their period of production due to frost. Involved are orchard fruits, strawberries, and truck garden vegetables. Hot waters circulated through such enterprises offer possibilities to extend growing seasons in the South including all-winter culture in some moderate climate areas. This could be used in greenhouses maybe. We need frost protection several nights a year. One can't afford pipes outdoors from either an economic or resource standpoint.

PRIORITY: 3/4

TITLE: Heated Waste Water in Animal and Human Housing

Situation Statement:

Animals perform more efficiently in suitably controlled environments. Poultry and swine are often raised indoors in confinement in the South. Feed efficiency is partially related to the amount of feed required to maintain body heat and provide good physiological and reproductive responses.

Air conditioning is a major energy use in the South and may have a major influence in its development. The use of waste heat for environmental control (heating and cooling) could have a major impact on both animals and man.

PRIORITY: 4/4

TITLE: Use of Waste Heated Waters for Irrigation

Situation Statement:

Waste heated water, when available could provide a warmer environment for extending the period of rice cultivation, for improved growth of irrigated vegetables and other crops, and similar special uses in southern agriculture. Most irrigation water is currently utilized during the warmer periods of the year. Techniques need to be developed whereby year around management practices can be related to this resource.

SECTION 12

RECYCLING MUNICIPAL AND INDUSTRIAL WASTES ON AGRICULTURAL LAND

Research Topics and Priorities

PRIORITY: 1/1

TITLE: Recycling Municipal and Industrial Sewage Effluent and Sludge Through the Plant-Soil System

Situation Statement:

Agricultural and forest plant-soils systems offer the potential for a useful alternative to advanced waste treatments. Recycling sewage effluents and sludge through the soil-plant system represents waste treatment with low energy requirements and provides for the utilization of unique aspects of agricultural science and technology, and supplies needed plant nutrients and water. Agricultural research is needed to successfully renovate the water and utilize the sludge, avoid excessive accumulations of pathogens, heavy metals (e.g. cadmium, mercury, selenium, copper, zinc, etc.), drugs, pesticides or their metabolites.

Research Approach: climatically and physiographically the Southern Region ranges from semi-arid desert and upland to humid uplands and low humid subtropics with the attendant differences in vegetation, and soil types. Rates of application of sewage effluent and sludges must be determined for geographic, climatic and vegetative types and regions. Operational research approaches should include hydraulic loading, rates, plant management for nitrogen removal, soil fixation of phosphates, identification of nitrogen passing beyond the root zone, surface and ground water quality, fate and concentration of pathogens, accumulation of deleterious ions and compounds in the soil and their effect upon plant composition and suitability for food or livestock feed. Should be a topic for a regional research effort.

SECTION 13

SYSTEMS ANALYSIS

Research Topics and Priorities

PRIORITY: 1/1

TITLE: Systems Analysis

Situation Statement:

Since most environmental quality problems are multifaceted, individual scientists usually direct their attention to specific problems. The basis for selection of a specific problem may be professional interest or intuitive judgment about the impact of a specific solution. Historically, this method of problem selection has produced solutions with high impact, i.e. major breakthroughs, and solutions to many problems which were ultimately found to be mundane or trivial. Unfortunately, most individual scientists have no a priori method to perceive those problems whose solution have a high probability of having major impact. Systems analysis can provide a technique whereby those specific environmental problem areas which offer a high likelihood of major impact may be identified and integrated into the specifically needed multidisciplinary research areas involved. This topic should be suitable for regional research projects.

SECTION 14

POLLUTANTS AS RESOURCES

Research Topics and Priorities

PRIORITY: 1/1

TITLE: Pollutants as Resources

Situation Statement:

Pollutants are generally considered to be undesirable and technology is developed to get rid of them. A frequently stated definition for a pollutant is "a resource out of place." Increased research is needed to identify the potential for useful products from pollutants. For example, energy sources (methane), animal feeds, fertilizer, building products, waste heat, etc. Through proper utilization, savings in production cost can be generated and disposal impacts eliminated. Should be considered as a regional research effort.

SECTION 15

AQUATIC WEED CONTROL

Research Topics and Priorities

PRIORITY: 1/1

TITLE: Aquatic Weed Control

Situation Statement:

Aquatic weeds choke streams and lakes, interfere with drainage and irrigation, reduce the effectiveness of mosquito control, interfere with fishing, boating and other water sports and produce off tastes. When killed with herbicides, they sink to the bottom and are oxidized which can reduce the oxygen content of the water until fish kills result. The nutrients contained in the weeds are released back into the water and further stimulate weed growth. Most of the troublesome, aquatic weeds are exotics which have made explosive growth because their native enemies are not present in the United States and because of enrichment of many waters with plant nutrients from many sources.

Research Approaches: Insects, disease, animals, mechanical harvesting, water level control and herbicides used separately and in combination should be investigated as means of aquatic weed control and management.

ENVIRONMENTAL QUALITY RESEARCH

Actual 1966 - Projected 1977 - Actual 1972

Year and RPA	AGENCY OR INSTITUTION							
	ARS	FS	ERS	USDA Total	SAES	1890	OCI[a]	State Total
1966 - Actual SMY's - National Program								
RPA 214	0.6	1.0	0.0	1.6	13.0			
RPA 901	41.6	3.6	0.0	45.2	66.6			
TOTAL	42.2	4.6	0.0	46.8	79.6			
(1/4 National)	10.6	1.2		10.8	19.8			
1977 - Projected SMY's - National Program[b]								
RPA 214	18	12		30	40			
RPA 901	167	19	16	201	215			
TOTAL	185	31	16	231	255			
(1/4 National)	46.2	7.8	4	57.8	65.8			
1972 - Actual SMY's - Southern Region Only								
RPA 214	8.0	0.0	0.0	8.0	10.1	0.8	(0.6)[c]	11.5
RPA 901	24.7	(7.1)[c]	0.0	24.7	45.9	1.1	(0.8)[c]	47.8
TOTAL - 1972	32.7	(7.1)[c]	0.0	39.7	56.0	1.9	(1.4)[c]	59.3

[a] OCI = Other Cooperating Institutions (McIntire-Stennis)

[b] 1977 as projected in 1966

[c] Primary research - considered as secondary due to change in classification system

ENVIRONMENTAL QUALITY RESEARCH
SMY's - SOUTHERN REGION
1973

State or Territory	USDA Agencies			USDA Total	State Agencies			State Agencies Total	TOTAL
	ARS	ERS	FS		SAES	1890	OCI		
Alabama	2.1			2.1	6.7			6.7	8.8
Arkansas				1.4				1.4	1.4
Florida	6.8			6.8	13.2	0.2		13.3	20.1
Georgia	8.7			8.7	5.1	0.5		5.6	14.3
Kentucky					2.9			2.9	2.9
Louisiana	8.6			8.6	7.6			7.6	16.2
Mississippi					4.0	0.8		4.8	4.8
North Carolina	3.3			3.3	7.4			7.4	10.7
Oklahoma	8.4	1.0		9.4	1.9	1.1		3.0	12.4
Puerto Rico					2.0			2.0	2.0
South Carolina					3.2	1.0		4.2	4.2
Tennessee					1.9	0.8		2.7	2.7
Texas	2.9			2.9	6.7			6.7	9.6
Virginia	2.0			2.0	1.1	1.1		2.2	4.2
Virgin Islands	0.1			0.1					0.1
TOTAL - Southern Region	42.9	1.0		43.9	65.1	5.5		70.5	114.4